Remarks/Arguments

Claims 1-19 remain in the case. Claims 1, 7, 8 and 11-19 have been amended. Claims 2-6, 9 and 10 remain in their original form. Claim 20 has been withdrawn.

Claims 1, 7, 8, 11, 13-14, 16 and 18 have been amended to avoid invoking 35 U.S.C. 112, sixth paragraph. In particular, all instances of phrases such as –the step of— have been deleted. In claim 2, the word "steps" has been replaced with 'operations" Applicant wishes to note for the record that the amendments are neither narrowing, nor are the amendments being made for a reason substantially related to patentability. Applicant respectfully submits that no new matter has been added in the amendments.

Claim Rejections Under 35 USC § 112(2)

Claims 15 and 17 recite the limitation "the predetermined acquisition parameter". The cited claims have been amended. While the wording has changed the context of the claims and their structure are believed to have changed substantially. Having reviewed the rejection carefully, Applicant is of the opinion that Examiner is confused regarding the intended antecedence. Specifically, amended claim 13 recites,

> "acquiring an image of a fingertip of an individual;
>
> processing the image to determine a value indicative of a physical parameter of the fingertip, the physical parameter affecting the acquired image and independent of the identity of the individual..."

In contrast, claim 14 recites,

> "providing a plurality of biometric template images of a same fingertip, each biometric template image associated with a different predetermined physical parameter of a specific fingertip, the physical parameter affecting the acquired image and independent of the identity of the individual, wherein each biometric

template image is processed according to the predetermined image-processing process."

In this way, each biometric sample has a physical parameter associated therewith. The biometric samples described with reference to the quoted portion of claim 14 relate to biometric sample provided in which the physical parameter of the fingertip is known. In contrast the physical parameter of the fingertip in claim 13 is "determined." Thus, in claims 15 and 17 the phrase "determined physical parameter" relates to the physical parameter of the biometric sample determined as described in claim 13. Applicant is hopeful that this distinction is now clear and that there is not ambiguity regarding antecedence with regards to the second paragraph of 35 U.S.C. 112.

Claim Rejections Under 35 USC § 112(1)

Claim 9 and 15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. Specifically, Examiner states that "fingerprint moisture may be variably distributed" based upon a variety of variables. Applicant asserts that changes in fingerprint moisture content within a single brief scanning operation are typically relatively minor in comparison to changes in an overall average moisture parameter of a fingertip. Specifically, while moisture content varies within a fingertip, Applicant is of the opinion that in many cases the physical parameters of a fingertip are sufficiently consistent within a given fingertip to be evaluated as a single set of physical parameters and provide information useful in determining the most appropriate data to compare corresponding fingerprint data therewith. For example, a hotel could provide a system where their patrons access their rooms using a fingerprint authentication system. If such hotel is located in a dry desert then a patron having entered from outside and being authenticated would likely provide a fingerprint sample that would be appropriately described as "relatively dry". The same patron being suitably hydrated and having stayed in a comfortable air-conditioned environment would likely provide a fingerprint sample that would be appropriately described as having a "normal" moisture content. The same patron having been recently swimming in the hotel swimming pool would likely provide a fingerprint that is properly described as "moist". In this context, determining the moisture

content of the fingertip when a fingerprint data sample is provided is well within the understanding of a person of ordinary skill in the art who has reviewed and understood the present application. As such, Applicant is of the opinion that both claims 9 and 15 are properly supported by the disclosure and should not be rejected under the first paragraph of U.S.C. 112.

Claim Rejections Under 35 USC § 102

Claims 1-3 and 6 are rejected under 35 U.S.C. 102(e) as being anticipated by Jain et al. (U.S. Patent 6,185,318). Applicant would like to thank Examiner for specifically stating an interpretation of "acquisition parameter" in the context of the old claim 1. Claim 1 has been amended to ensure that the "parameter" is more clearly understood. Specifically, claim 1 now recites,

"A method for fingerprint authentication comprising:
> *acquiring an image of a fingertip of an individual;*
> *processing the image to determine a value indicative of a physical parameter of the fingertip, the physical parameter affecting the acquired image and independent of the identity of the individual;*
> *comparing the image to a stored biometric template, the comparison process based on the determined value; and,*
> *performing one of an authentication and a rejection in dependence upon the comparison. "*

Thus, according to amended claim 1 it is now unambiguous that the parameter being referred to is independent of the individual whose fingertip image is being processed. This is neither taught nor suggested in the prior art of Jain. Specifically, when Jain refers to "feature extraction" Jain is referring to determining a set of features that are specifically useful for identifying an individual. Referring to Jain, (column 1 beginning line 66),

> *"Once the image is acquired into the computer memory or onto disk, relevant minutia features are extracted (220). Not all of the features thus extracted are reliable; some of the unreliable features are optionally edited or pruned (step 230),*

> *e.g. manually. The resultant reliable features are used for matching the fingers*
> *(step 240)."*

Thus, it is apparent that amended independent claim 1 is not anticipated as described in U.S.C. 102(e) by the prior art of Jain. According to Jain, the unreliable features are to be extracted in order to provide data that will provide a robust system for correctly comparing fingerprint images. In the system according to amended claim 1 a very different approach is being pursued. Specifically, in the method of amended claim 1 a value indicative of a physical parameter of the fingertip is determined. This determined value is then used in a comparison process. Conversely, in the prior art of Jain variations in the physical condition of the fingertip used in providing the fingerprint image could lead to the "unreliable features" referred to by Jain. In the prior art section of Jain it is suggested that fingerprint image be edited or filtered to remove "unreliable features". Jain then discloses a method and apparatus for segmenting a digital image associated with fingerprint (ref abstract of Jain). In other words, the prior art of Jain provides a better filter for separating "reliable features" from "unreliable features". Applicant asserts that features that would be considered as "unreliable" given a lack of knowledge of the physical parameters of fingertip of an individual at the time of image acquisition are potentially of use in identifying the individual when the physical parameters are generally known. In this way, it is apparent that the invention as recited in amended independent claim 1 is substantially different and not obvious in light of the prior art of Jain. Thus, it is apparent that amended claim 1 is now allowable in light of Jain.

Similarly, claims 2, 3 and 6 depend from amended claim 1 and therefore claims 2, 3 and 6 cannot be anticipated or obvious in light of Jain in isolation.

Claims 11 is rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 6,072,895 (Bolle 895) Independent claim 11 has been amended and now reads,

> *"A method for processing a fingerprint image comprising:*
> *a) acquiring an image of a fingertip of an individual;*

b) *processing the acquired image to determine a value indicative of a physical parameter of the fingertip, the physical parameter affecting the acquired image and independent of the identity of the individual; and,*

c) *selecting an image-processing process in dependence upon the determined value, the image-processing process for removing a subset of features of the acquired image. "*

The prior art of Bolle 895 discusses determining a variety of parameters associated with a fingerprint image. However, Bolle 895 does not select "an image-processing process in dependence upon the determined value" as taught by the inventive method recited in amended independent claim 11. Instead, Bolle 895 evaluates features, more specifically, data associate with minutiae. In other words, Bolle 895 only uses one process for feature extraction. As such there is no act of "selecting an image-processing process" in Bolle 895. Effectively, Bolle 895 teaches an image processing process that is believed to be so robust that, according to Bolle 895, it will extract the desired minutiae of the fingerprint simply by evaluating the pixel data of the fingerprint. This is quite different from the method recited in amended independent claim 11. Thus, a person of ordinary skill in the art could apply amended claim 11 to provide a method that supports determining if a fingerprint is provided from a dry fingertip and then selecting a image-processing process specific to dry fingerprint data for removing a subset of features. Bolle 895 does not teach or suggest such a method. As such, the prior art of Bolle 895 does not render amended independent claim 11 either anticipated or obvious.

Claims 19 is rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 6,072,895 (Bolle 895) Independent claim 19 has been amended and how recites,

"A system for fingerprint authentication comprising:

a sensing area for capturing an image of a fingertip of an individual presented thereto;

a memory storage area for storing captured images therein; and,

a processor for executing code thereon to process the captured image to determine a value indicative of a physical parameter, the physical parameter affecting the

acquired image and independent of the identity of the individual, and to compare the captured image to a template image according to an image-processing process selected in dependence upon the determined value. "

The prior art of Bolle 895 discusses determining a variety of parameters associated with a fingerprint image. Significantly, Bolle 895 does not specify providing a processor capable of selecting "an image-processing process in dependence upon the determined value" as taught by the inventive system recited in amended claim 19. Instead Bolle 895 evaluates individual features or minutiae. As such, Bolle 895 clearly does not teach all of the features present in the system according to amended independent claim 19 and therefore amended independent claim 19 is not anticipated by Bolle 895. A person of ordinary skill in the art would not arrive at the system described by amended independent claim 19 based upon the teachings of Bolle 895. Specifically, such a person, having reviewed and understood Bolle 895 would not be lead to providing a system that compares a "captured image to a template image according to an image-processing process selected in dependence upon the determined value." Instead, such a person would provide a system that captures image data and consistently applies a specific image-processing process. Further, such a system according to Bolle 895 would not determine a physical parameter but instead a parameter of the image data. Therefore amended independent claim 19 is not obvious in light of Bolle 895

Claim Rejections Under 35 USC § 103(a)

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jain ,in view of U.S. Patent 5,995,640, Bolle 640. Examiner states,

> *"Jain et al. suggest matching (comparing) input and template fingerprint images according to different sets of criteria or assumptions (Jain et al. column 16, lines 41-44). These are listed as items 1-4 in Jain et al. column 4. "*

Applicant is of the opinion that Examiner may have misinterpreted the prior art of Jain. Specifically, Jain column 16 lines 35 to 44 recites,

> *"For each test line Ti (e.g., T1 1130), the following weighted summation Gi (e.g., G1) is performed: (i) intensities of line pixels Ri (e.g., g1-g7 intensities of r1-r7 1171-1177, respectively) weighted with respective weights Wi (e.g., w1-w7 1201-1207); the magnitude of each weight preferably as prescribed above; (ii) intensities of test pixels Qi (e.g., h1-h7 intensities of q1-q7 1161-1167, respectively) weighted with respective weights Xi (e.g., x1-x7 1201-1207); the magnitude of each weight preferably as prescribed above. "*

Having carefully reviewed the cited text, Applicant is unable to follow the logic trail provided by Examiner as quoted above. Additionally, the section of Jain listing problems 1-4 in column 4 refers to a listing of problems with the prior art (ref. Section title.) As such, it is clear that Jain is explaining that there is a problem and then trying to solve it. Applicant acknowledges that the problem addressed by Jain is analogous to the problem being addressed according to the method of claim 4. However, this does not contribute to the method of claim 4 being obvious in any way. Applicant asserts that the method taught by Jain is fundamentally different from the method recited in amended independent claim 1 from which claim 4 depends (reference previous arguments regarding 102 rejection of claim 1 provided hereinabove.)

The prior art of Bolle 640 clearly addresses determining in a fingerprint image contains an image portion represent a dry fingerprint impression (ref title and abstract of Bolle 640.) As such the prior art of Bolle 640 is believed to be complimentary to the method recited in amended independent claim 1 but not equivalent to amended claim 1. Specifically amended claim 1 recites,

> *"processing the image to determine a value indicative of a physical parameter of the fingertip, the physical parameter affecting the acquired image and independent of the identity of the individual;*
>
> *comparing the image to a stored biometric template, the comparison process based on the determined value"*

Neither Bolle 640 nor Jain teach the above quoted section of amended claim 1. As such it is apparent that claim 1 cannot be obvious in light of the combination of Bolle 640 and Jain. Thus, it is apparent that claim 4, which depends from amended claim 1, cannot be obvious in light of the same combination of prior art references.

Claims 5 and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jain et al. and Bolle 640, as applied to claim 4, in further view of U.S. Patent 5,109,428 (Igaki.) Igaki teaches a system that provides controlled pressure to a finger in progressive steps. The system of Igaki scans a fingerprint image associated with each of these steps and applies a filtering system to determine which of the minutia are consistent between the various steps. This minutiae data is then available to authenticate individuals. This process is described clearly in Fig. 6 of Igaki. It is apparent that Igaki does not teach,

> *"processing the image to determine a value indicative of a physical parameter of the fingertip, the physical parameter affecting the acquired image and independent of the identity of the individual;*

> *comparing the image to a stored biometric template, the comparison process based on the determined value"*

as recited in amended claim 1.

Thus it is apparent that none of Bolle 640, Jain nor Igaki teach the above quoted portion of claim 1. Instead, the prior art references of Jain and Igaki focus on filtering fingerprint data to determine data that is either consistent or expected to be consistent between different impressions of the same fingerprint provided under differing conditions. This difference would not be obvious to a person of ordinary skill in the art having reviewed and understood the aforementioned prior art. As previously described, the prior art of Bolle 640 is focused on determining if a fingerprint, or a portion thereof is dry. As such amended claim 1 is not obvious in light of the combination of Bolle 640, Jain and Igaki. Therefore claims 5, 9 and 10, which depend from claim 1, cannot be obvious in light of the same references.

Claims 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jain et al., Bolle 640, and Igaki, as applied to claim 5, in further view of US patent 6,072,895 (Bolle 895)

The prior art of Bolle 895 is focused on filtering minutiae from a scanned fingerprint image. Part of the filtering process taught by Bolle 895 involves feature extraction in which the fingerprint is evaluated for a variety of physical variables (ref. Bolle 895, column 5, lines 26-34) These variables are then used to "prune" features that are believed to be inconsistent or unreliable. As recited in the abstract of Bolle 895 (with bold lettering provided by Applicant for emphasis),

> *"The pruning process is based on (i) locations and image contrast, (ii) the distances, orientations of minutiae and (iii) spatial distributions of minutiae and ridges of the fingerprint. **The minutiae that remain after the pruning can be used for feature matching.**"*

The method as recited in amended claim 1 is quite different. It does not suggest such a pruning of minutiae. Indeed, Applicant asserts that the minutiae "pruned" according to the method of Bolle 895 are potentially useful in the sense they could be used to enhance the accuracy of the authentication process, provided that the fingerprint data associated with the "physical parameters" as recited in amended claim 1 is available.

Applicant asserts that the method recited in amended claim 1 is not obvious in light of Bolle 895. Specifically, Bolle 895 does not teach or suggest,

> *"processing the image to determine a value indicative of a physical parameter of the fingertip, the physical parameter affecting the acquired image and independent of the identity of the individual;*
>
> *comparing the image to a stored biometric template, the comparison process based on the determined value"*

Further, as explained hereinabove, Bolle 640, Jain and Igaki do not teach this portion of the inventive method either. As such it is not rational to expect a person of ordinary skill

in the art to combine four independent references and produce a portion of a method that none of the cited prior art references teach. Therefore, it is apparent that claim 1 is not obvious in light of the combination of Bolle 895, Bolle 640, Jain and Igaki. Claims 7 and 8 depend from amended claim 1 and, therefore, claims 7 and 8 cannot be obvious in light of the same combination of prior art references.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bolle 895, in view of U.S. Patent 6,064,753 (Bolle 753), in further view of U.S. Patent 6,005,963 Bolle (963). Amended independent claim 11 recites,

> *"processing the acquired image to determine a value indicative of a physical*
> *parameter of the fingertip, the physical parameter affecting the acquired image and*
> *independent of the identity of the individual; and,*
> *selecting an image-processing process in dependence upon the determined value,*
> *the image-processing process for removing a subset of features of the acquired*
> *image."*

In contrast, Bolle 895 teaches a filtering technique that identifies a set of features and applies a robust filtering algorithm. The filtering algorithm according to Bolle 895 is not specifically described as being feature dependent. Additionally, the "features" identified by Bolle 895 are not attributed to a physical parameter of the fingertip that provided the fingerprint data analysed in Bolle 895. Therefore, claim 11 is not obvious in light of Bolle 895.

The prior art of Bolle 753 addresses a system and method for controlling distortion when acquired inkless fingerprint images. Specifically, in Bolle 753 when a biometric sample is given with too much pressure or torque then the system of Bolle 753 is likely to reject the data sample and request a new data sample be provided (ref. Abstract of Bolle 753.) Referring to Bolle 753, column 4, beginning on line 54,

> *"In a preferred embodiment of the invention, the force and torque are monitored*
> *during contact and images are taken within a range of force and/or torque. In*

> *other embodiments of the invention, the force and /or torque applied is limited*
> *during the image acquisition. "*

In the system of claim 11 the image of a biometric sample is processed to determine a physical parameter. Bolle 753 does not suggest this. Additionally, Bolle 753 does not teach or suggest "selecting an image-processing process in dependence upon the determined valu" as recited in amended independent claim 11. Therefore, amended independent claim 11 is not obvious in light of Bolle 753 in isolation.

The prior art of Bolle 963 teaches system for determining if a fingerprint image contains a portion indicative of a fingerprint impression. The passage cited by Examiner states, " [it]..is critical to design an automatic scheme that examines the quality of an acquired fingerprint image before it is processed so that fingerprints with poor quality caused by conditions like partial impressions or poor condition of the finger (too dry, too wet) can thereafter be identified." Applicant feels that Examiner has used the quoted passage inappropriately. First, the quoted passage is provided in a section detailing shortcomings of the prior art. Bolle 963 is not necessarily solving the problem stated in the way that it is disclosed in amended independent claim 11. Bolle 963 teaches "an accurate and reliable fingerprint image pre-processing system that detects images containing partial prints. An object of this invention is an accurate and reliable fingerprint image pre-processing system that quantifies fingerprint image quality. Another object of this invention is an accurate and reliable fingerprint image pre-processing system quantifies fingerprint image quality and reject images of poor quality, one reason for poor quality can be that the print is partial print." Thus, while Bolle 963 is attributing a "quality" to a fingerprint image, Bolle 963 is not "selecting an image-processing process in dependence upon the determined value" as recited in amended independent claim 11.

As none of Bolle 963, Bolle 753 and Bolle 895 teach "selecting an image-processing process in dependence upon the determined value" it is uncertain how a person of ordinary skill in the art would combine them to produce such a process. Indeed, Bolle 963 appears to suggest that fingerprint data having poor quality, which from the above quoted portion would indicate a fingertip that is too wet or too dry, should be rejected automatically.

Applicant feels that this teaches away from claim 12. Specifically, claim 12 recites, "wherein the physical parameter is selected from a group comprising: a moisture condition of the fingertip; and, an applied pressure of the fingertip." Applicant is of the opinion that the invention as recited in claims 11 and 12 mitigates what would ordinarily be perceived as a lack of "quality" in a biometric sample by attributing a value associated with a physical parameter to the biometric data and selecting an appropriate image-processing process in dependence upon the determined value. None of Bolle 963, Bolle 753 nor Bolle 895 teach or suggest this. Therefore amended independent claim 11 is not obvious in light of the combination of Bolle 963, Bolle, 753 and Bolle 895. Further, although these three prior art references have a common inventor each addresses a different, though related, problem. It is not certain how a person of ordinary skill in the art could be expected to combine them in a useful fashion. While Examiner has cited statements in the prior art that appear to relate to amended claims 11 and 12, Applicant is of the opinion that these statements, when reviewed in the context of their references, fail to teach the invention recited in amended independent claim 11 and amended dependent claim 12 in a way that would render the invention as recited in amended independent claim 11 and dependent claim 12 obvious. As such, it is apparent amended independent claim 11 is not obvious in light of the combination of Bolle 963, Bolle 753 and Bolle 895.

Claim 13 is rejected under 35 U.S.C. 103(a) as being obvious in light of Jain. Independent claim 13 has been amended and now recites,

"A method for fingerprint authentication comprising:

a) acquiring an image of a fingertip of an individual;

b) processing the image to determine a value indicative of a physical parameter of the fingertip, the physical parameter affecting the acquired image and independent of the identity of the individual;

c) processing the acquired image according to a predetermined image-processing process to remove a subset of features from the acquired image;

d) selecting a biometric template in dependence upon the determined value, the biometric template processed according to the predetermined image-processing process;

e) comparing the processed acquired image to the biometric template; and,

f) performing one of an authentication and a rejection in dependence upon the comparison"

In contrast, Jain teaches extracting "unreliable features". Jain suggests "unreliable features" are potentially the result of a variety of circumstances listed in Jain column 4 lines 20 to 64. The invention as recited in independent claim 13 selects a biometric template in dependence upon the determined value. Thus, for example, a person of ordinary skill in the art, having read and understood amended independent claim 13 would have sufficient knowledge to produce a system supporting a method that would allow a fingerprint determined to have been provided from a moist fingertip to be compared with biometric templates corresponding to fingerprints that were determined to be provided from moist fingertips. The prior art of Jain does not teach or suggest this. As such, amended independent claim 13 is not obvious in light of Jain.

Claims 14 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jain, in view of Igaki. The prior art of Igaki teaches a system in which a fingertip is subjected to an increasing contact pressure and fingerprint data is taken from the fingertip at various differing levels of pressure thereby providing a related set of fingerprint data. The individual samples of the related set of fingerprint data are compared to determine a set of consistent features, which Igaki refers to as minutiae data. Igaki does not teaching storing minutiae data in a way that associates specific pressure levels with specific minutiae. As such the prior art of Igaki does not support, "selecting a biometric template in dependence upon the determined value, the biometric template processed according to the predetermined image-processing process" as recited in amended independent claim 13. Therefore it is apparent that amended independent claim 13 is not obvious in light of Igaki in isolation.

The combination of Igaki and Jain would not lead one of skill in the art to the method of amended independent claim 13. Specifically, both Igaki and Jain are focused on filtering biometric data in order to avoid inconsistencies associated with as same biometric sample providing somewhat different biometric data as a result of changes in physical parameters of the biometric data sample. Neither Igaki nor Jain teach or suggest, "selecting a biometric template in dependence upon the determined value, the biometric template processed according to the predetermined image-processing process" and therefore, amended independent claim 13 would not be obvious to a person of ordinary skill in the art in light of the combination of Igaki and Jain. Claims 14, 17 and 18 depend from amended independent claim 13 and therefore, claims 14, 17 and 18 cannot be obvious in light of the same combination of prior art references.

Allowable Subject Matter

Claims 15 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Independent claim 13 from which claims 15 and 16 depend has been amended and is now allowable.

Applicant looks forward to favourable reconsideration of the present application.

No new matter has been added.

Please charge any additional fees required or credit any overpayment to Deposit Account No: 50-1142.

Respectfully submitted,

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Amendments to the Drawings:

The drawing sheet for Figure 7d was submitted in response to the Notice of Omitted Items in a Nonprovisional Application mailed November 09, 2001. We enclose a replacement sheet for this drawing.

Attachment: Replacement Sheet for Figure 7d following page 21 of this paper.